CLAIMS

What is claimed:

1. In the transalkylation of polyalkylated aromatic compounds, the process comprising:

(a) providing a transalkylation reaction zone containing a transalkylation catalyst comprising a high porosity zeolite-Y molecular sieve having a surface area of no more than 500 m^2/g;

(b) supplying a polyalkylated aromatic component comprising polyalkyl benzenes in which the predominant alkyl substituents contain from 2 to 4 carbon atoms to said transalkylation reaction zone;

(c) supplying benzene to said transalkylation reaction zone;

(d) operating said transalkylation reaction zone under temperature and pressure conditions to maintain said polyalkylated aromatic component in the liquid phase and effective to cause disproportionation of said polyalkylated aromatic component to arrive at a disproportionation product having a reduced polyalkyl benzene content and an enhanced mono-alkyl benzene content; and

(e) recovering said disproportionation product from said transalkylation zone;

2. The method of claim 1 wherein said high porosity zeolite-Y molecular sieve has a surface area of about 400 m^2/g or less.

3. The method of claim 2 wherein said high porosity zeolite-Y molecular sieve has a surface area within the range of 350-400 m^2/g.

4. The method of claim 1 wherein said polyalkylated benzene comprises alkyl substituents containing 2 or 3 carbon atoms.

5. The method of claims 1 wherein said polyalkylated aromatic component comprises polyethylbenzene.

6. The method of claim 5 wherein at least a portion of the polyethylbenzene is recovered from a previous transalkylation reaction.

7. The method of claim 1 further comprising:

(a) supplying a feedstock containing benzene and a C_2-C_4 alkylating agent to an alkylation reaction zone containing a molecular sieve aromatic alkylation catalyst having an average pore size which is less than the average pore size of said high porosity zeolite-Y;

(b) operating said alkylation reaction zone to produce an alkylated product comprising a mixture of mono-alkylated and benzene by said alkylating agent in the presence of said molecular sieve alkylation poly-alkylated aromatic components; and

(c) supplying the alkylation product from said alkylation reaction zone to an intermediate recovery zone for the separation and recovery of mono-alkylbenzene from the alkylation product and for the separation and recovery of a polyalkylated aromatic component, including dialkylbenzene, and employing said polyalkylated aromatic component as at least a portion of the polyalkylated aromatic component supplied in subparagraph (b) of claim 1.

8. The method of claim 7 wherein said alkylating agent contains 2 or 3 carbon atoms.

9. The method of claim 8 wherein said alkylating agent comprises ethylene.

10. In the alkylation and transalkylation process of aromatic compounds, the process comprising:

(a) supplying a feedstock containing benzene into a multistage alkylation reaction zone having a plurality of series connected catalyst beds each containing a molecular sieve aromatic alkylation catalyst having a pore size which is smaller than the average pore size of the hereinafter-recited zeolite-Y;

(b) supplying a C_2-C_4 alkylating agent to said reaction zone;

(c) operating said reaction zone at temperature and pressure conditions to maintain said feedstock in the gaseous phase and causing gas-phase alkylation of said benzene by said alkylating agent in the presence of said catalyst to produce an alkylated product comprising a mixture of monoalkylated and polyalkylated aromatic components;

(d) recovering said alkylated product from said reaction zone and supplying said product from said reaction zone to a benzene recovery zone for the separation of benzene substrate from said alkylated product;

(e) operating said benzene recovery zone to produce a lower boiling benzene containing fraction and a higher boiling fraction comprising a mixture of monoalkylated aromatic and polyalkylated aromatic component,

(f) recycling benzene from said benzene recovery zone to said reaction zone;

(g) supplying said higher boiling fraction from said benzene recovery zone to a secondary separation zone;

(h) operating said secondary separation zone to produce a secondary lower boiling fraction comprising a monoalkylated aromatic component and a higher boiling fraction comprising a heavier polyalkylated aromatic component;

(i) supplying at least a portion of said polyalkylated aromatic component including the dialkylated and trialkylated aromatics in said polyalkylated component to a transalkylation reaction zone containing a high porosity zeolite-Y molecular sieve having a surface area of no more than 500 m^2/g;

(j) supplying benzene to said transalkylation zone;

(k) operating said transalkylation reaction zone under temperature and pressure conditions to maintain said benzene in the liquid phase and effective to cause disproportionation of said polyalkylated aromatic fraction to arrive at a disproportionation product having a reduced polyalkyl benzene content and an enhanced monoalkyl benzene content;

(l) supplying at least a portion of said disproportionation product to said benzene recovery zone.

11. The process of claim 10 wherein said alkylating agent is an ethylating or propylating agent.

12. The process of claim 11 wherein said alkylating agent is ethylene or propylene.

13. The process of claim 12 wherein said alkylating agent is ethylene.

14. The method of claim 13, wherein said alkylation catalyst comprises predominately monoclinic silicalite having a crystal size of 0.5μ or less and formulated with an alumina binder to provide catalyst particles having a surface area/volume ratio of at least 60 $in.^{-1}$

15. The method of claim 14, wherein at least some of said heavier polyalkylated aromatic component from said secondary separation zone is, prior to the operation of paragraph (i), applied to a tertiary separation zone wherein said heavier polyalkylated aromatic component is separated into a tertiary lower boiling fraction of said polyalkylated aromatic component comprising dialkyl and trialkyl aromatics and a heavier higher boiling residue fraction and wherein said tertiary lower boiling fraction of said polyalkylated aromatic component is supplied to said transalkylation reaction zone in accordance with paragraph (i).

16. The method of claim 15, wherein a first portion of the heavier polyalkylated aromatic component is supplied to said tertiary separation zone in accordance with claim 15 and thence from said tertiary separation zone to said transalkylation zone and a second portion of said heavier polyalkylated aromatic component from said secondary separation zone is supplied directly to said transalkylation zone.

17. The method of claim 16 wherein said high porosity zeolite-Y molecular sieve has a surface area of about 400 m^2/g or less.

18. In the alkylation and transalkylation of aromatic compounds, the process comprising:

(a) supplying a feedstock containing benzene into a multistage alkylation reaction zone comprising having a plurality of series connected catalyst beds each containing a pentasil molecular sieve aromatic alkylation catalyst;

(b) supplying a C_2-C_4 alkylating agent to said reaction zone;

(c) operating said reaction zone at temperature and pressure conditions to maintain said feedstock in the gaseous phase and causing gas-phase alkylation of said benzene by said alkylating agent in the presence of said catalyst to produce an alkylated product comprising a mixture of monoalkylated and polyalkylated aromatic components;

(d) recovering said alkylated product from said reaction zone and supplying said product from said reaction zone to a benzene recovery zone for the separation of benzene substrate from said alkylated product;

(e) operating said benzene recovery zone to produce a lower boiling benzene containing fraction and a higher boiling fraction comprising a mixture of monoalkylated aromatic and polyalkylated aromatic component;

(f) recycling benzene from said benzene recovery zone to said reaction zone;

(g) supplying said higher boiling fraction from said benzene recovery zone to a secondary separation zone;

(h) operating said secondary separation zone to produce a second lower boiling fraction comprising a monoalkylated aromatic component and a higher boiling fraction comprising a heavier polyalkylated aromatic component;

(i) supplying a first portion of said polyalkylated aromatic component including dialkylated and trialkylated aromatics in said polyalkylated product to a transalkylation reaction zone containing a zeolite transalkylation catalyst comprising a high porosity zeolite-Y molecular sieve having a surface area of no more than 500 m^2/g and a pore size greater than the pore size of said pentasil catalyst;

(j) supplying a second portion of said polyalkylated aromatic component from said secondary separation zone to a tertiary separation zone which is operated to separate said heavier polyalkylated aromatic component into a lower boiling fraction of said polyalkylated aromatic component comprising dialkyl and trialkylated aromatics and a higher boiling fraction comprising a residue fraction;

(k) supplying said lower boiling fraction of said polyalkylated aromatic component from said tertiary separation zone to said transalkylation reaction zone in addition to said first portion from said secondary separation zone;

(l) supplying benzene to said transalkylation zone;

(m) operating said transalkylation reaction zone under temperature and pressure conditions to maintain said feedstock in the liquid phase and effective to cause disproportionation of said polyalkylated aromatic fraction to arrive at a disproportionation product having a reduced polyalkyl benzene content and an enhanced monoalkyl benzene content; and

(n) supplying at least a portion of said disproportionation product to said benzene recovery zone.

19. The process of claim 18 wherein said alkylation agent is ethylene.

20. The method of claim 19 wherein said high porosity zeolite-Y molecular sieve has a surface area of about 400 m^2/g or less.